# FINAL REPORT: ASSESSMENT IN TEAM GAMES

Harold F. O'Neil

Richard Wainess


Advance Design Information

Sherman Oaks, CA

**20050504 089**

December 31, 2004  v.5

# REPORT DOCUMENTATION PAGE

| 1. REPORT DATE (DD-MM-YYYY) | 2. REPORT TYPE | 3. DATES COVERED (From - To) |
|---|---|---|
| 31-12-2004 | Final | Mar 2004 – Dec 2004 |

**4. TITLE AND SUBTITLE**

Final Report: Assessment in Games

**5a. CONTRACT NUMBER**
N00014-04-M-0088

**5b. GRANT NUMBER**

**5c. PROGRAM ELEMENT NUMBER**

**6. AUTHOR(S)**

O'Neil, Harold F.
Wainess, Richard

**5d. PROJECT NUMBER**

**5e. TASK NUMBER**

**5f. WORK UNIT NUMBER**

**7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)**

Advance Design Information
15366 Longbow Drive
Sherman Oaks, CA 91403

**8. PERFORMING ORGANIZATION REPORT NUMBER**

ADI0001

**9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)**

Contract Auditor
DCMA Los Angeles
16111 Plummer Street, Bldg. 10, 2nd Floor
Sepulveda, CA 91343

**10. SPONSOR/MONITOR'S ACRONYM(S)**

DCM

**11. SPONSOR/MONITOR'S REPORT NUMBER(S)**

**12. DISTRIBUTION / AVAILABILITY STATEMENT**

Unlimited/Unclassified

**DISTRIBUTION STATEMENT A**
Approved for Public Release
Distribution Unlimited

**13. SUPPLEMENTARY NOTES**

**14. ABSTRACT**

The purpose of this study was to conduct a feasibility study for an assessment in team games. The logic for both individual and team assessment is outlined in a companion report to ONR (O'Neil, Baker, Wainess, Chen, Mislevy, & Kyllonen, 2004). The goal of the research in general was to produce an analysis to permit the development and application of metrics to assess the impact of participating in a team game environment. The game environment provides an opportunity to assess key attributes of learning in teams. These include both process and outcome skills for teams. Another form of impact involves the development of social capital among the players. A literature review and frameworks for the measurement of team skills and social capital are included. Finally, a discussion of several issues related to the relationship of DARWARS to combat readiness completes the report.

**15. SUBJECT TERMS**

Assessment, team training, games, multiplayer games

| 16. SECURITY CLASSIFICATION OF: Unclassified | | | 17. LIMITATION OF ABSTRACT | 18. NUMBER OF PAGES | 19a. NAME OF RESPONSIBLE PERSON Harold F. O'Neil |
|---|---|---|---|---|---|
| a. REPORT | b. ABSTRACT | c. THIS PAGE | | | 19b. TELEPHONE NUMBER (include area code) |
| U | U | U | UU | 23 | 818-501-4004 |

# Contents

# Executive Summary

The purpose of this study was to conduct a feasibility study for an assessment in team games. The logic for both individual and team assessment is outlined in a companion report to ONR (O'Neil, Baker, Wainess, Chen, Mislevy, & Kyllonen, 2004). The goal of the research in general was to produce an analysis to permit the development and application of metrics to assess the impact of participating in a team game environment. The game environment provides an opportunity to assess key attributes of learning in teams. These include both process and outcome skills for teams. Another form of impact involves the development of social capital among the players. A literature review and frameworks for the measurement of team skills and social capital are included. Finally, a discussion of several issues related to the relationship of DARWARS to combat readiness completes the report.

## Purpose

The purpose of this study was to conduct a feasibility study for an assessment in team games. The logic for both individual and team assessment is outlined in a companion report to ONR (O'Neil, Baker, Wainess, Chen, Mislevy, & Kyllonen, 2004) and that text, where appropriate, is provided in this report. The goal of the research in general was to produce an analysis to permit the development and application of metrics to assess the impact of participating in a team game environment. The game environment provides an opportunity to assess key attributes of learning in teams. These include both process and outcome skills for teams. Another form of impact involves the development of social capital among the players.

While effectiveness of game environments can be documented in terms of intensity and longevity of engagement, there is much less solid information about what outcomes are systematically achieved by the use of multi-user games to train participants in acquiring technical or strategic material. What is missing is how games should be evaluated at a number of points. First is the degree to which they are designed to foster the key skills and strategies desired. Secondly, the impact of game playing needs to be studied to determine what works, when, and for which players. This report will support the design of an approach that will allow the development of techniques for assessing learning of teams through games.

## Literature Review

One of our initial tasks was to conduct a literature review for team games focusing on empirical studies using adults. Six search terms from PsycINFO were used for the years 1990–2003: *multiplayer, multi-player, MUD, massively multiplayer, massively multi-player,* and *MMG* OR *MMOG*. The term *MUD* means either multi-user domain or multi-user dungeon. *MMG* refers to massively multiplayer game, and *MMOG* refers to massively multiplayer online

game. As may be seen in Table 1, only three of the search terms (*multiplayer, multi-player,* and *MUD*) returned any abstracts. For the term *multiplayer* there were a total of 12 abstracts (PsycINFO returned 4 unique abstracts, EducationAbs returned 3 abstracts, and SocialSciAbs returned 5). For the term *multi-player* there were a total of 11 unique abstracts (PsycINFO returned 3 unique abstracts, EducationAbs returned 3, and SocialSciAbs returned 5). The term *MUD* returned the largest number of abstracts ($N = 23$; 17 unique abstracts from PsycINFO, 5 from EducationAbs, and 1 from SocialSciAbs). All searches combined yielded 46 unique abstracts. The same relevance criteria used in the broader *video games* search (see O'Neil et al., 2004) were applied to this *multiplayer video games* search). Only one article was relevant—"Team practice schedules: What do we know?" by Lori Rhodenizer, Clint A. Bowers, and Maureen Bergondy, published August 1998 in *Perceptual & Motor Skills* (pp. 31-34). The article reported on an investigation of the effect of practice schedule on team learning in a multiplayer radar simulation decision-making task. In a design using 32 two-person teams, results indicated that teams that practiced under a distributed schedule performed better than teams that practiced under a massed schedule. We also conducted a second search for articles published in 2004, for this report, and found none that met our criteria.

Table 1

Multiplayer: Search

| Search term | Total hits per database | Relevant hits[a] | Relevant empirical abstracts[b] | Relevant empirical military abstracts[c] |
|---|---|---|---|---|
| Multiplayer | 12 | 1 | 1 | 0 |
| Multi-player | 11 | 0 | 0 | 0 |
| MUD | 23 | 0 | 0 | 0 |
| Massively multiplayer | 0 | 0 | 0 | 0 |
| MMOG or MMG | 0 | 0 | 0 | 0 |

[a]Used in training and adults. [b]Either qualitative or quantitative information. [c]Used military personnel as participants.

In summary, the literature search indicated that there is essentially no relevant empirical research conducted on the topic of learning or assessment using team games. There was a single exception for multiplayer games, and this study focused on 2-person teams. Thus, there is very limited research evidence on the training effectiveness of team games or the skills required. We suggest, based on our expert opinion, that the relevant skills to be assessed by DARWARS would be team skills and social capital. The following section offers a theoretical review of measurement of team skills.

## Team Skills

An important distinction is offered by Salas, Dickinson, Converse, and Tannenbaum (1992) for types of team skills, that is, task work versus teamwork. Task work skills influence how well an individual performs on a particular team task, whereas teamwork skills, or team process skills, influence how effective team members will be as part of a team. A theoretical framework has been provided by Dr. Jan Cannon-Bowers (Cannon-Bowers & Bowers, 2004). As part of another ONR contract, for which Dr. O'Neil is the PI, Cannon-Bowers has produced a set of guidelines to teach and assess team skills. Table 2 provides a list of her team performance measurement guidelines. Tables 3 and 4 provide two examples of the guidelines. It is recommended for DARWARS team performance assessment that metrics be developed and an evaluation study using the four levels of Kirkpatrick's (1994) evaluation framework be conducted using her team performance guidelines as design standards.

Table 2

Team Performance Measurement (Cannon-Bowers & Bowers, 2004)

1. Assess pre-training teamwork competencies (i.e., knowledge, skills and attitudes)

2. Construct team-level outcome measures for use at the conclusion of training (e.g., mission accomplishment, sales, safety records, etc.)

3. Construct measures of transfer performance (on the job)

4. Construct teamwork process measures (diagnostic; during training)

5. Link measurement points to training events in scenarios/vignettes/role plays

6. Record as much as possible (voice, keystrokes, etc.) during training sessions

7. Use checklists and other observational devices to aid collection of performance data

8. Foster systematic intra-team monitoring and assessment during training and debrief sessions

9. Assess post-training knowledge (e.g., interpositional knowledge; shared knowledge, shared mental models, shared expectations)

10. Assess post-training skills (e.g., communication skills; intra team monitoring, error detection, correction; giving/receiving feedback, self-correction strategies; backup, compensatory behaviors; team leader behavior)

11. Assess post-training attitudes (e.g., collective efficacy)

Table 3

Assess Post-Training Knowledge (e.g., Interpositional Knowledge; Shared Knowledge, Shared Mental Models, Shared Expectations) (Cannon-Bowers & Bowers, v.1, 9/17/04) (Cannon-Bowers & Bowers, 2004)

| | |
|---|---|
| 1. Guideline (nontechnical): | Develop measures of interpositional knowledge and shared knowledge to use at the conclusion of training; these can be compared to pre-training measures if available. |
| 2. Guideline (technical): | If team training is successful, team members should have a good sense of their own role in the team as well as the role of teammates (i.e., interpositional knowledge), and shared crucial knowledge about how to perform (i.e., shared mental models). These should be measured at the conclusion of training. |
| 3. Guideline based on: | Research |
| 4. Degree of confidence: | High |
| 5. Comments: | Research suggests that team members must understand their role in the team as well as the role of teammates. This knowledge enables them to better coordinate during episodes of performance. Relatively simple measures of interpositional knowledge can be useful in assessing this competency. For example, paper and pencil measures that ask team members to rate the tasks that they and their teammates are responsible for have been used for this purpose.<br><br>Shared mental models—that is knowledge that the team must share so that they can adapt their performance quickly and without much discussion—have been found to be important to effective team functioning. Several approaches to measuring shared mental models in teams have been developed. |
| 6. References: | Cooke, N. J., Kiekel, Preston A., Salas, E., & Cannon-Bowers, J. A. (2003). Measuring team knowledge: A window to the cognitive underpinnings of team performance. *Group Dynamics, 7*(3), 179-199.<br><br>Eby, L. T., Meade, A. W., & Parisi, A. G. (1999). The development of an individual-level teamwork expectations measure and the application of a within-group agreement statistic to assess shared expectations for teamwork. *Organizational Research Methods, 2,* 366-394.<br><br>Hoeft, R. M., Jentsch, F. G., & Harper, M. E. (2003). TPL-KATS—Concept Map: A computerized knowledge assessment tool. *Computers in Human Behavior, 19,* 653-657.<br><br>Kraiger, K., & Wenzel, L. H. (1997). Conceptual development and empirical evaluation of measures of shared mental models as indicators of team effectiveness. In M. T. Brannick, E. Salas, & C. Prince (Eds.), *Team performance assessment and measurement: Theory, methods, and applications* (pp. 63-84). Mahwah, NJ: Lawrence Erlbaum Associates.<br><br>Neuman, G. A., & Wright, J. (1999). team effectiveness: beyond skills and cognitive ability. *Journal of Applied Psychology, 84,* 376-389. |

Table 4

Assess Post-Training Skills (e.g., Communication Skills; Intra-Team Monitoring, Error Detection, Correction; Giving/Receiving Feedback, Self-Correction Strategies; Backup, Compensatory Behaviors; Team Leader Behavior) (Cannon-Bowers & Bowers, v.1, 9/17/04) (Cannon-Bowers & Bowers, 2004)

| | |
|---|---|
| 1. Guideline (nontechnical): | Develop measures of important teamwork skills (identified by the team task analysis conducted prior to training) as a means to assess the effectiveness of training interventions. |
| 2. Guideline (technical): | Effective teamwork is multidimensional, requiring several team-level skills. Measures of skills identified as crucial in the team task analysis should be developed to assess training effectiveness. |
| 3. Guideline based on: | Research |
| 4. Degree of confidence: | High |
| 5. Comments: | Research indicates that teams require several team-level skills, depending on the nature of the team task they are performing (Cannon-Bowers, et al., 1995). The purpose of a team task analysis (conducted prior to training design) is to determine which skills are most important to the team at hand. Once the crucial team skills are identified, measures of these skills must be developed for use at the conclusion of training. The most typical team skills include: communication skills; intra-team monitoring, error detection, correction; giving/receiving feedback, self-correction strategies; backup, compensatory behaviors; team leader behavior. |
| | While traditional (paper and pencil) measures of team skills can be used, a better strategy is to develop work samples, exercises or scenarios for team members to perform. Such measures are typically better because they sample actual behavior, which is affected by many factors including the team members' ability to identify when and how to respond given situational demands. If behavior-based measures are used, observational checklists and other devices can be used to assess whether the team has acquired the skill. |
| 6. References: | Cannon-Bowers, J. A., Tannenbaum, S. I., Salas, E., & Volpe, C. (1995). Defining competencies and establishing team training requirements. In R. A. Guzzo & E. Salas (Eds.), *Team effectiveness and decision-making in organizations* (pp. 333-380). San Francisco, CA: Jossey-Bass. |
| | Dickenson, T. L., & McIntyre, R. M. (1997). A conceptual framework for team performance measurement. In M. T. Brannick, E. Salas, & C. Prince (Eds.), *Team performance assessment and measurement: Theory, methods, and applications* (pp. 19-44). Mahwah, NJ: Lawrence Erlbaum Associates. |
| | Johnston, J. H., Smith-Jentsch, K. A., & Cannon-Bowers, J. A. (1997). Performance measurement tools for enhancing team decision-making training. In M. T. Brannick, E. Salas, & C. Prince (Eds.), *Team performance assessment and measurement: Theory, methods, and applications* (pp. 311-327). Mahwah, NJ: Lawrence Erlbaum Associates. |

## Social Capital

It could be argued that DARWARS should increase the social capital of the DoD. Social capital is one of the invisible assets of an organization and complements its intellectual,

financial, and physical assets (Hargreaves, 2003). As may be seen in Figure 1, social capital consists of trust, collective efficacy, collective effort, teamwork, transparency, and networks between its members and its individual partners. It is recommended that DARWARS also be evaluated using this framework.
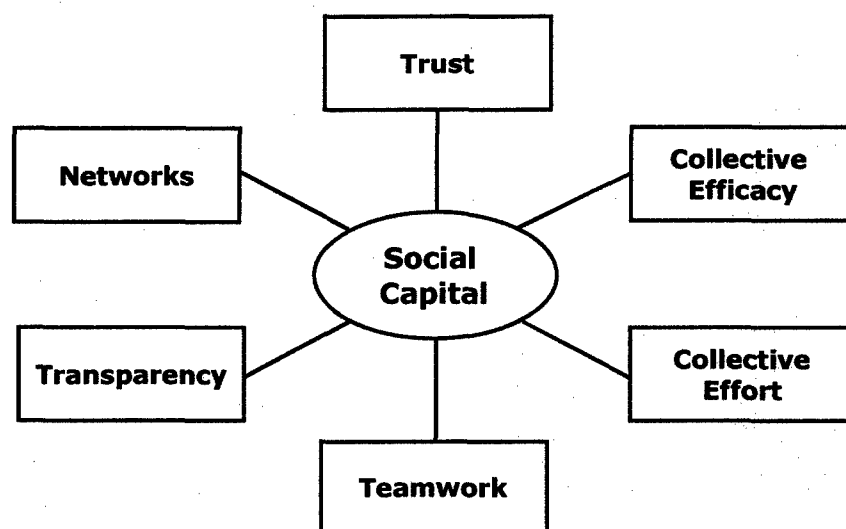


*Figure 1.* Elements of social capital.

Measurement of social capital is in its infancy. In prior research, we have developed survey measures of some of the constructs in Figure 1. The Teamwork Questionnaire (O'Neil, Wang, Lee, Mulkey, & Baker, 2003) has been used in several studies, has acceptable reliability and validity, and measures teamwork skills (i.e., adaptability, coordination, decision making, leadership, and interpersonal teamwork skills). We have also developed survey measures of collective efficacy and effort (Marshall et al., 2003). The Marshall et al. set of measures (which includes the teamwork measure) was recently used in a healthcare setting as the Healthcare Teams Questionnaire. We have attached a first-cut adaptation of that questionnaire in the Appendix. The item numbers track the scoring key. For a DARWARS application, one would need to select or develop items to measure trust, networking and transparency, as well as a set of

measures to target specific DARWARS functionality (e.g., diagnosis, individualized training plans, scheduling of assets, multiplayer games). We have also used a survey approach in the past for measurement of Information Technology (IT) systems (Muraida, Spector, O'Neil, & Marlino, 1993). A recommended set of DARWARS functionality survey questions to be developed would focus on measurement of buy-in and the perceptions of success and failure of DARWARS. Elements would include how one thinks and feels about DARWARS.

This effort should also assess over time the development of social capital by DARWARS participants. Collaborative decision making with DARPA should occur regarding the design, comparative analysis, frequency of measurement, and reporting framework. The effort will be divided into two major activities: (A) design and initial administration, and (B) implementation of successive survey waves, analysis, and reporting.

A. Design and Initial Administration

Objective: To design and field the first administration of an on-line survey to evaluate the DARWARS impact.

Task 1. Create measures of the components of social capital (i.e., collective efficacy, teamwork, collective effort, transparency, networks, and trust) and augment the item pool so that at least 15 items for each component can be administered. In addition, survey items will be created regarding the functional components of DARWARS.

B. Implementation of Successive Survey Waves, Analysis, and Reporting

Objective: Implement the assessment on a regular basis

Task 2. Revise scales as necessary, administer the survey, analyze data, and report.

### Relationship of DARWARS and Combat Readiness

In order to estimate the potential success or failure of DARWARS on readiness several issues would need to be resolved. (a) Alignment of DARWARS training philosophy of experiential training with a Service mission philosophy that embeds individual training standards

within collective training standards. These standards are embedded in mission-essential task lists, and finally all standards contribute to the mission (PM Training Systems, n.d., p. 1). (b) A concept of operation of how DARWARS would be used, either on-duty or off-duty. For example, on-duty implementation issues are shown in Table 5, and DARWARS off-duty training issues are shown in Table 6. The nature of the DARWARS impact on readiness would differ depending on whether DARWARS is implemented on-duty or off-duty. The same "game" would not be implemented in both environments.

Table 5

On-Duty Implementation Issues: Impact on Game

---

If on-duty in military school:
- Integrate into Plan of Instruction
  - Specific objectives, assessments, minimal role playing
- Instructor training
  - Need nature/type of feedback
- Doctrinal accuracy
  - Limited role for fantasy
- Motivation provided by instructor
  - Game can be less fun
- Good applications
  - Initial acquisition training
- Time available is expressed in hours/days/weeks

---

Table 6

Off-Duty Implementation Issues: Impact on Game

---

If off-duty:
- Integrate into recreation/family time
  - Objectives/assessments less important
  - Flexible role playing
- Student "training" need
  - Improve self-regulation
  - Increase requirement for feedback, automated After-Action Reviews
- Flexible Doctrine/Strategy/Tactics
- Motivation provided by student/game
  - Game needs to be fun
- Good application
  - Refresher training to prevent skill decay
- Time available is expressed in minutes/hours

---

(c) An adoption of a framework of training readiness and assessable indicators. Orlansky,

Hammon, and Horowitz (1997) have outlined a framework and indicators. First, citing Finch

(1996), they define readiness:

> Readiness is, as the Deputy Undersecretary of Defense for Readiness describes it:
>
> the general ability of forces to arrive where they are needed, on time and prepared to effectively carry out assigned mission objectives for which they were designed. The ability of units to be ready on time to carry out their missions, in turn, is a function of having the equipment, supplies, logistics and experienced people with the skills to accomplish assigned tasks. (Finch, 1996). (as quoted by Orlansky, Hammon, & Horowitz, 1997, p. S-1)

As may be seen in Table 7, Orlansky et al. provide an input, process, and output to further

analyze readiness. We have adapted one of their tables.

Table 7

Training Process Indicators

| Input | Process | Output |
|---|---|---|
| Resources<br><br>Costs | Training<br><br>Courses<br>Events<br>Exercised<br>OPTEMPO<br>Accomplishments | Performance<br><br>Measures of effectiveness<br>Exercise outcomes<br>Performance to standards<br>Training readiness |

Source: Adapted from Orlansky, Hammon, & Horowitz, 1997, p. S-2.

Orlansky et al. (1997) also make a critical distinction between type of indicator—i.e.,

demonstrated training performance (outcome measures)—and training accomplishment (process

measures). As may be seen in Table 8, each major type of indicator has multiple indicators. For

DARWARS, choices would have to be made among indicators depending on the specific

DARWARS features; for those that are Service-specific, one would accept that Service's

indicator of either training performance or training accomplishment.

Table 8

Training Indicators

| Type of indicator | Indicator | Service |
|---|---|---|
| Demonstrated training performance | percent of crews or platoons qualified | Army<br>Marine Corps |
| | percent of submarine Training Readiness Examination above/below average | Navy subsurface |
| | percent of Operational Readiness Inspection excellent or outstanding | Air Force |
| | percent of tasks trained to standard | Army<br>Marine Corps |
| Training accomplishment | percent of mission essential tasks trained | Army<br>Marine Corps |
| | percent training accomplished by primary mission areas | Navy |
| | percent of training accomplished (percent crews combat ready) | Navy aviation<br>USMC aviation |
| | percent Graduated Combat Capability level B or A | Air Force |
| | percent participation in Combat Training Centers/Combat Arms Exercises | Army<br>Marine Corps |

Source: Orlansky, Hammon, & Horowitz, 1997, p. S-5.

## Summary

The purpose of this study was to conduct a feasibility study for an assessment in team games. The logic for both individual and team assessment is outlined in a companion report to ONR (O'Neil, Baker, Wainess, Chen, Mislevy, & Kyllonen, 2004). The goal of the research in general was to produce an analysis to permit the development and application of metrics to assess the impact of participating in a team game environment. The game environment provides an opportunity to assess key attributes of learning in teams. These include both process and outcome skills for teams. Another form of impact involves the development of social capital among the players. A literature review and frameworks for the measurement of team skills and

social capital are included. Finally, a discussion of several issues related to the relationship of

DARWARS to combat readiness completes the report.

# References

Cannon-Bowers, J. A., & Bowers, C. (2004). *Team training assessment*. Unpublished technical report, University of Central Florida, Orlando, FL.

Finch, L. C. (1996, June). *Analysis for support of readiness and training*. Presentation by the Deputy Under Secretary of Defense (Readiness) to the Military Operations Research Society, Fort Leavenworth, KS.

Hargreaves, D. H. (2003, January). *From improvement to transformation*. Keynote lecture at the annual meeting of the International Congress for School Effectiveness and Improvement (ICSEI) "Schooling the Knowledge Society," Sydney, Australia.

Kirkpatrick, D. L. (1994). *Evaluating training programs: The four levels*. San Francisco, CA: Berrett-Koehler Publishers.

Marshall, L., O'Neil, H. F., Johnston, L., Visocnik, F., Kainey, G., & Abedi, J. (2003). *Efficacy, teamwork skills and effort: The Healthcare Teams Questionnaire*. Manuscript submitted for publication, Los Angeles Childrens Hospital/University of Southern California.

Muraida, D. J., Spector, J. M., O'Neil, H. F., Jr., & Marlino, M. R. (1993). Evaluation. In J. M. Spector, M. C. Polson, & D. J. Muraida (Eds.), *Automating instructional design. Concepts and issues* (pp. 293-321). Englewood Cliffs, NJ: Educational Technology Publications.

O'Neil, H. F., Baker, E. L., Wainess, R., Chen, C., Mislevy, R., & Kyllonen, P.(2004). Final report on plan for the assessment and evaluation of individual and team proficiencies developed by the DARWARS environments (Report to DARPA/ONR). Sherman Oaks, CA: Advance Design Information

O'Neil, H. F., Jr., Wang, S., Lee, C., Mulkey, J., & Baker, E. L. (2003). Assessment of teamwork skills via a teamwork questionnaire. In H. F. O'Neil, Jr., & R. Perez (Eds.), *Technology applications in education: A learning view* (pp. 283-303). Mahwah, NJ: Lawrence Erlbaum Associates.

Orlansky, J., Hammon, C. P., & Horowitz, S. A. (1997). *Indicators of training readiness* (IDA Paper P-3283). Alexandria, VA: Institute for Defense Analyses.

PM Training Systems: Marine Corps Systems Command. (n.d.). *Close combat Marine workbook. Training aid for MCI 8104*. Orlando, FL: Author.

Salas, E., Dickinson, T. L., Converse, S. A., & Tannenbaum, S. I. (1992). Toward an understanding of team performance and training. In R. W. Swezey & E. Salas (Eds.), *Teams: Their training and performance* (pp. 3–30). Norwood, NJ: Ablex.

# Appendix

## DARWARS Social Capital Questionnaire

## Revision 6/23/04 OF HEALTHCARE TEAMS QUESTIONNAIRE

**NOTE:** Three scales in the previous version have been deleted from the current revision (6/23/04). Items will be renumbered in the next revision. Item stems need to be tailored to DARWARS.

### SCORING KEY

### DARWARS SOCIAL CAPITAL QUESTIONNAIRE

| Scales | Items |
|---|---|
| Collective Efficacy (*N* = 7) | 3, 9, 17, 27, 38, 48, 55 |
| Collective Effort (*N* = 8) | 1, 4, 10, 20, 30, 41, 49, 57 |
| Coordination (*N* = 5) | 16, 24, 32, 42, 56 |
| Decision Making (*N* = 6) | 11, 18, 25, 34, 43, 50 |
| Leadership (*N* = 7) | 5, 12, 19, 26, 36, 45, 52 |
| Interpersonal (*N* = 6) | 14, 21, 28, 37, 58, 62 |
| Adaptability (*N* = 5) | 29, 39, 46, 53, 61 |
| Communication (*N* = 7) | 8, 23, 31, 40, 47, 54, 60 |

**Collective Efficacy Trait Subscale (L. Marshall-Stern & H. F. O'Neil, 2001)**
3. I believe that my team will contribute to our team's patient satisfaction ratings.
9. I'm certain that my team has knowledge of how to work in a team .
17. I'm confident my team has the basic teamwork skills.
27. I'm confident my team can coordinate teamwork activities.
38. I'm confident my team can do an excellent job on assignments and tasks.
48. I'm certain my team has excellent patient care task-related skills.
55. I'm confident my team will do well on our work.

**Collective Effort (L. Marshall-Stern & H. F. O'Neil, 2001)**
1. My team uses methods and procedures for working together that are just right for the tasks we have to perform.
4. My team works hard to do well even if they don't like a task
10. My team puts forth it's best effort on tasks.
20. My team works as hard as possible on tasks.
30. My team concentrates as hard as they can when doing a task.
41. My team works hard on a task even if it does not count.
49. My team is willing to do extra work on tasks to improve our knowledge.
57. My team believes practice makes perfect

**COORDINATION - Organizing team activities to complete a task on time**
16. When I work as part of a team, I allocate the tasks according to each team member's abilities.
24. When I work as part of a team, I help ensure the proper balancing of the workload.
32. When I work as part of a team, I do my part of the organization in a timely manner.
42. When I work as part of a team, I track other team members' progress.
56. When I work as part of a team, I emphasize the meeting of deadlines.

**DECISION MAKING - Using available information to make decisions**
11. When I work as part of a team, I understand and contribute to the organizational goals.
18. When I work as part of a team, I know the process of making a decision.
25. When I work as part of a team, I know how to weigh the relative importance among different issues.
34. When I work as part of a team, I prepare sufficiently to make a decision.
43. When I work as part of a team, I solicit input for decision making from my team members.
50. When I work as part of a team, I am able to change decisions based upon new information.

**LEADERSHIP - Providing direction for the team**

5.  When I work as part of a team, I exercise leadership.
12. When I work as part of a team, I teach other team members.
19. When I work as part of a team, I serve as a role model in formal and informal interactions.
26. When I work as part of a team, I lead when appropriate, mobilizing the group for high performance.
36. When I work as part of a team, I lead the team effectively.
45. When I work as part of a team, I demonstrate leadership and ensure team results.
52. When I work as part of a team, I try to bring out the best in others.

**INTERPERSONAL - Interacting cooperatively with other team members**

14. When I work as part of a team, I interact cooperatively with other team members.
21. When I work as part of a team, I conduct myself with courtesy.
28. When I work as part of a team, I respect the thoughts and opinions of others in the team.
37. When I work as part of a team, I treat others with courtesy.
58. When I work as part of a team, I accept individual differences among members.
62. When I work as part of a team, I treat all my team members as equals.

**ADAPTABILITY - Recognizing problems and responding appropriately**

29. When I work as part of a team, I can identify potential problems readily.
39. When I work as part of a team, I willingly contribute solutions to resolve problems.
46. When I work as part of a team, I adapt readily to varying conditions and demands.
53. When I work as part of a team, I recognize conflict.
61. When I work as part of a team, I identify needs or requirements and develop quality/timely solutions.

**COMMUNICATION - Clear and accurate exchange of information**

8.  When I work as part of a team, I ensure the instructions are understood by all team members prior to starting the task.
23. When I work as part of a team, I ask for the instructions to be clarified when it appears not all the team members understand the task.
31. When I work as part of a team, I communicate in a manner to ensure mutual understanding.
40. When I work as part of a team, I seek and respond to feedback.
47. When I work as part of a team, I listen attentively.
54. When I work as part of a team, I clearly and accurately exchange information.
60. When I work as part of a team, I pay attention to what others are saying.

# PART II  QUESTIONNAIRE

**Directions:** This set of questions is to help us understand the way you think and feel about working with others. We know that different parts of your life, such as your job, recreational activities, or service to your community, may involve working with others and have different requirements, and that you may react differently in each kind of activity. Nonetheless, read each statement below and indicate how you generally think or feel. There are no right or wrong answers. Do not spend too much time on any one statement. Remember, give the answer that seems to describe how you generally think or feel.

|  |  | Almost never | Sometimes | Often | Almost always |
|---|---|---|---|---|---|
| 1. | My team uses methods and procedures for working together that are just right for the tasks we have to perform. | 1 | 2 | 3 | 4 |
| 3. | I believe that my team will contribute to our team's patient satisfaction ratings. | 1 | 2 | 3 | 4 |
| 4. | My team works hard to do well even if they don't like a task | 1 | 2 | 3 | 4 |
| 5. | When I work as part of a team, I exercise leadership. | 1 | 2 | 3 | 4 |
| 8. | When I work as part of a team, I ensure the instructions are understood by all team members prior to starting the task. | 1 | 2 | 3 | 4 |
| 9. | I'm certain that my team has knowledge of how to work in a team. | 1 | 2 | 3 | 4 |
| 10. | My team puts forth it's best effort on tasks. | 1 | 2 | 3 | 4 |
| 11. | When I work as part of a team, I understand and contribute to the organizational goals. | 1 | 2 | 3 | 4 |
| 12. | When I work as part of a team, I teach other team members. | 1 | 2 | 3 | 4 |
| 14. | When I work as part of a team, I interact cooperatively with other team members. | 1 | 2 | 3 | 4 |
| 16. | When I work as part of a team, I allocate the tasks according to each team member's abilities. | 1 | 2 | 3 | 4 |
| 17. | I'm confident my team has the basic teamwork skills. | 1 | 2 | 3 | 4 |
| 18. | When I work as part of a team, I know the process of making a decision. | 1 | 2 | 3 | 4 |

| | Almost never | Sometimes | Often | Almost always |
|---|---|---|---|---|
| 19. When I work as part of a team, I serve as a role model in formal and informal interactions. | 1 | 2 | 3 | 4 |
| 20. My team works as hard as possible on tasks. | 1 | 2 | 3 | 4 |
| 21. When I work as part of a team, I conduct myself with courtesy. | 1 | 2 | 3 | 4 |
| 23. When I work as part of a team, I ask for the instructions to be clarified when it appears not all the team members understand the task. | 1 | 2 | 3 | 4 |
| 24. When I work as part of a team, I help ensure the proper balancing of the workload. | 1 | 2 | 3 | 4 |
| 25. When I work as part of a team, I know how to weigh the relative importance among different issues. | 1 | 2 | 3 | 4 |
| 26. When I work as part of a team, I lead when appropriate, mobilizing the group for high performance. | 1 | 2 | 3 | 4 |
| 27. I'm confident my team can coordinate teamwork activities. | 1 | 2 | 3 | 4 |
| 28. When I work as part of a team, I respect the thoughts and opinions of others in the team. | 1 | 2 | 3 | 4 |
| 29. When I work as part of a team, I can identify potential problems readily. | 1 | 2 | 3 | 4 |
| 30. My team concentrates as hard as they can when doing a task. | 1 | 2 | 3 | 4 |
| 31. When I work as part of a team, I communicate in a manner to ensure mutual understanding. | 1 | 2 | 3 | 4 |
| 32. When I work as part of a team, I do my part of the organization in a timely manner. | 1 | 2 | 3 | 4 |
| 34. When I work as part of a team, I prepare sufficiently to make a decision. | 1 | 2 | 3 | 4 |
| 36. When I work as part of a team, I lead the team effectively. | 1 | 2 | 3 | 4 |
| 37. When I work as part of a team, I treat others with courtesy. | 1 | 2 | 3 | 4 |
| 38. I'm confident my team can do an excellent job on the assignments and tasks. | 1 | 2 | 3 | 4 |

| | Almost never | Sometimes | Often | Almost always |
|---|---|---|---|---|
| 39. When I work as part of a team, I willingly contribute solutions to resolve problems. | 1 | 2 | 3 | 4 |
| 40. When I work as part of a team, I seek and respond to feedback. | 1 | 2 | 3 | 4 |
| 41. My team works hard on a task even if it does not count. | 1 | 2 | 3 | 4 |
| 42. When I work as part of a team, I track other team members' progress. | 1 | 2 | 3 | 4 |
| 43. When I work as part of a team, I solicit input for decision making from my team members. | 1 | 2 | 3 | 4 |
| 45. When I work as part of a team, I demonstrate leadership and ensure team results. | 1 | 2 | 3 | 4 |
| 46. When I work as part of a team, I adapt readily to varying conditions and demands. | 1 | 2 | 3 | 4 |
| 47. When I work as part of a team, I listen attentively. | 1 | 2 | 3 | 4 |
| 48. I'm certain my team has excellent patient care task-related skills. | 1 | 2 | 3 | 4 |
| 49. My team is willing to do extra work on tasks to improve our knowledge. | 1 | 2 | 3 | 4 |
| 50. When I work as part of a team, I am able to change decisions based upon new information. | 1 | 2 | 3 | 4 |
| 52. When I work as part of a team, I try to bring out the best in others. | 1 | 2 | 3 | 4 |
| 53. When I work as part of a team, I recognize conflict. | 1 | 2 | 3 | 4 |
| 54. When I work as part of a team, I clearly and accurately exchange information. | 1 | 2 | 3 | 4 |
| 55. I am confident my team will do well on our work. | 1 | 2 | 3 | 4 |
| 56. When I work as part of a team, I emphasize the meeting of deadlines | 1 | 2 | 3 | 4 |
| 57. My team believes practice makes perfect | 1 | 2 | 3 | 4 |
| 58. When I work as part of a team, I accept individual differences among members. | 1 | 2 | 3 | 4 |

|  | Almost never | Sometimes | Often | Almost always |
|---|---|---|---|---|
| 60. When I work as part of a team, I pay attention to what others are saying. | 1 | 2 | 3 | 4 |
| 61. When I work as part of a team, I identify needs or requirements and develop quality/ timely solutions. | 1 | 2 | 3 | 4 |
| 62. When I work as part of a team, I treat all my team members as equals. | 1 | 2 | 3 | 4 |

Thank you...